

Introduction to Linux – Summer School 2019

Maksym Figat

Warsaw University of Technology, Institute of Control and Computation Engineering

July 2019

WELCOME IN POLAND! – 欢迎来到波兰!

欢迎来到波兰!

OUR TEAM

PRESENTATION PLAN

OUR TEAM

LINUX

BASIC COMMANDS

LABS

PRESENTATION

ROBOT PROGRAMMING AND PATTERN RECOGNITION GROUP

Web page: https://www.robotyka.ia.pw.edu.pl

LABS.

ROBOT PROGRAMMING AND PATTERN RECOGNITION GROUP - TEAM

Web page: https://www.robotyka.ia.pw.edu.pl

TEAM Team

Meet our team members



Prof. Ph.D., D.Sc., Eng. Cezary Zieliński

His research interests focus on robotics in general and especially include: robot programming methods (robot programming languages and robot programming frameworks), multi-robot system controllers, robot kinematics, robot force control, visual servo control. utilisation of sensors in robot control. behavioural and hybrid (behavioural-deliberative) control of robots, general purpose programming languages, mechatronics, design of digital circuits. He is the author/coauthor of over 200 conference and journal papers concerned with the above mentioned research subjects.



Prof. Ph.D., D.Sc., Eng. Włodzimierz Kasprzak

Research interests: image and speech analysis. computer vision, pattern recognition and artificial intelligence.



More...

His main scientific interests focus on grasp planning, and manipulator trajectory planning

More...

More...

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Web page: https://www.robotyka.ia.pw.edu.pl



Ph.D. Fng. Tomasz Winiarski

His scientific interests focus on manipulator and gripper control (programming frameworks, force control, force and visual sensor data fusion for control nurnoses) and specialized mobile robots design



M.Sc. Fng. Maciei Stefańczyk

His main research interests include the use of visual information on many fields, including robotics and computer entertainment systems

More



M.Sc., Eng.

Dawid Seredyński His main scientific interests focus on grasp planning, manipulator trajectory planning and development of robotic applications

More...

More...



M.Sc., Eng.

Maksym Figat His main scientific interests focus on automatic metods of robot control systems geneneration



M.Sc., Eng.

Wojciech Dudek His scientific interests focus on mobile robot control systems, their localization and navigation and harmonization of their tasks



M.Sc., Eng. Maciej Wegierek

His scientific interests focus on robot control systems and theirs specification

OUR TEAM LINUX LABS. 000

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WHAT A ROBOTIC TEAM WOULD BE WITHOUT THE ...

Robots



Velma Impedance controlled dual arm robotic system. with active head and torso



Rico Mobile platform for indoor applications



Bombel 3-DOF educational robotic manipulator



Attractor Variable stiffness magnetic spring actuator



MiniRyś Mini mobile robot with two modes of locomotion



Velmobil Mecanum wheel robot base

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Ryś Mobile robot with two modes of locomotion



Nao Our small companion



IRp-6 Position-force controlled dual arm robotic system



Elektron Mobile robot with diferential base



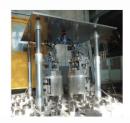
Lego Educational bricks



Scout Differentially driven mobile robot

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SwarmItFix robot

SwarmItFix robot supporting aluminium sheets

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WHAT IS LINUX?

Linux is the best-known and most-used open source operating system. As an operating system, Linux is software that sits underneath all of the other software on a computer, receiving requests from those programs and relaying these requests to the computer's hardware.

WHAT IS UBUNTU?

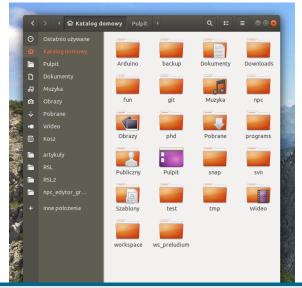
Ubuntu is a complete Linux operating system, freely available with both community and professional support.

INTRODUCTION TO UBUNTU

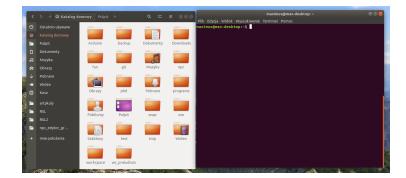


INTRODUCTION TO UBUNTU

OUR TEAM



INTRODUCTION TO UBUNTU



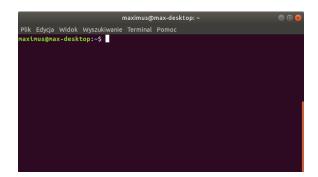
OUR TEAM

TERMINAL IN A NEW WINDOW

Create new terminal window: Press Ctrl + Alt + T Result:

TERMINAL IN A NEW WINDOW

Create new terminal window: Press Ctrl + Alt + T Result:



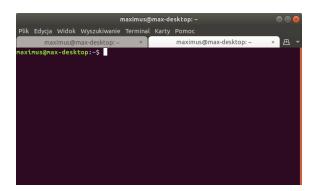
TERMINAL IN A NEW TAB

OUR TEAM

Create new terminal in a Tab: Press Ctrl + Shift + T Result:

TERMINAL IN A NEW TAB

Create new terminal in a Tab: Press Ctrl + Shift + T Result:



COMMAND Is

Command:

1 \$ 1s

Lists the content of current directory. Example:

COMMAND Is

Command:

1 \$ 1s

Lists the content of current directory. Example:



COMMAND ls < folder >

Command:

Lists the content of the specified directory. Example:

COMMAND Is < folder >

Command:

```
1 $ ls <name_of_folder>
```

Lists the content of the specified directory. Example:

```
maximus@max-desktop: ~
Plik Edycja Widok Wyszukiwanie Terminal Pomoc
maximus@max-desktop:~S ls
Arduino
          Downloads Muzvka
                             phd
                                       Publiczny
                                                           Wideo
                             Pobrane
                                       Pulpit
                                                           workspace
backup
          fun
                                                  Szablony
Dokumenty git
                     Obrazy programs snap
                                                           ws_preludium
                                                  tmp
maximus@max-desktop:~$ ls phd
dydaktyka konferencje
                         moje dokumenty
                                                  ważne artykuły
filmv
          moje_artykuly
                         przedmiotv
                                        recenzie
maximus@max-desktop:~S
```

COMMAND ls - l

Command:

Lists the content of current directory in a long form. Example:

COMMAND Is – 1

Command:

```
1  $ 1s −1
```

Lists the content of current directory in a long form. Example:

```
maximus@max-desktop: ~
Plik Edycja Widok Wyszukiwanie Terminal Pomoc
maximus@max-desktop:~S ls -l
razem 100
drwxr-xr-x 3 maximus maximus 4096 cze 24 00:59 Arduino
drwxr-xr-x 2 maximus maximus 4096 cze 15 15:31 backup
drwxr-xr-x 2 maximus maximus 4096 kwi 27 23:55 Dokumentv
drwxr-xr-x 6 maximus maximus 4096 cze 24 00:54 Downloads
drwxr-xr-x 10 maximus maximus 4096 lut 21 00:59 fun
drwxr-xr-x 9 maximus root
                              4096 cze 3 22:46 git
drwxr-xr-x 2 maximus maximus 4096 wrz 22 2018 Muzyka
drwxr-xr-x 6 maximus maximus 4096 kwi 8 16:07 npc
drwxr-xr-x 3 maximus maximus 20480 lip 17 23:00 Obrazy
drwxr-xr-x 11 maximus maximus 4096 maj 13 22:44 phd
drwxr-xr-x 10 maximus maximus 4096 lip 16 21:05 Pobrane
drwxr-xr-x 9 maximus root
                              4096 cze 24 00:53 programs
drwxr-xr-x 2 maximus maximus 4096 wrz 22 2018 Publiczny
drwxr-xr-x 3 maximus maximus
                              4096 cze 24 00:56 Pulpit
drwxr-xr-x 7 maximus maximus
                              4096 kwi 8 15:49 snap
drwxr-xr-x 9 maximus root
                              4096 cze 11 18:17 svn
```

COMMAND ls - a

Command:

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Lists the content of current directory not ignoring the entries starting with . (dot). Example:

COMMAND ls - a

LINUX

Command:

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```
1 $ 1s -a
```

Lists the content of current directory not ignoring the entries starting with . (dot). Example:

```
maximus@max-desktop: ~
Plik Edycja Widok Wyszukiwanie Terminal Pomoc
maximus@max-desktop:~$ ls -a
               .qnupq
               .googleearth
                                         .rpmdb
Arduino
               .gphoto
                                         .scribus
.arduino15
               .ICEauthority
                                         .sdformat
atom
               .ignition
                                         .shutter
backup
               .java
                                         snap
.bash_history
.bash loqout
               .local
.bashrc
               .matlab
                                         .subversion
cache
               .minecraft
                                         .sudo_as_admin_successful
              .mozilla
.catkin tools
.confia
               Muzvka
                                         Szablonv
. dbus
               npc
                                         .texlive2017
.designer
               Obrazy
                                         .thumbnails
Dokumentv
               .oracle_jre_usage
                                         .thunderbird
Downloads
               .pam_environment
                                         tmp
.fontconfig
               phd
                                         .viminfo
```

Command ls - la < folder > - multiple options

Command:

Lists the content of specified directory in a long form not ignoring the entries starting with . (dot). Example:

COMMAND Is - la < folder > - MULTIPLE OPTIONS

Command:

```
$ ls -la <name_of_folder>
```

Lists the content of specified directory in a long form not ignoring the entries starting with . (dot). Example:

```
maximus@max-desktop: ~
Plik Edycja Widok Wyszukiwanie Terminal Pomoc
maximus@max-desktop:~$ ls -la phd/
razem 44
drwxr-xr-x 11 maximus maximus 4096 lip 17 23:18 .
drwxr-xr-x 59 maximus maximus 4096 lip 17 22:54 ...
drwxrwxr-x 3 maximus maximus 4096 mar 13 21:30 dvdaktyka
drwxr-xr-x 2 maximus maximus 4096 lip 15 00:44 filmy
drwxr-xr-x 4 maximus maximus 4096 maj 14 15:15 konferencje
drwxr-xr-x 2 maximus maximus 4096 paź 24 2018 moje artykuly
drwxr-xr-x 4 maximus maximus 4096 kwi 30 20:47 moje dokumenty
drwxr-xr-x 4 maximus maximus 4096 mar 18 15:29 przedmioty
drwxrwxr-x 3 maximus maximus 4096 lip 16 12:21 pw
drwxrwxr-x 3 maximus maximus 4096 sty 28 00:30 recenzje
-rw-r--r- 1 maximus maximus 0 lip 17 23:18 .summerschool
-rw-r--r-- 1 maximus maximus
                                0 lip 17 23:17 .test
drwxrwxr-x 13 maximus maximus 4096 kwi 28 18:31 ważne artykuły
maximus@max-desktop:~S
```

PRECISE DESCRIPTION OF ANY COMMAND

Command:

```
$ man <any_command>
```

Precise description of command *ls* (or any other command) can be found utilising *man* command. Example:

000 00000

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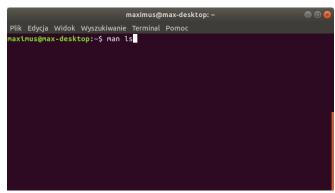
Precise description of any command

Command:

LINITX

```
1 $ man <any_command>
```

Precise description of command *ls* (or any other command) can be found utilising *man* command. Example:

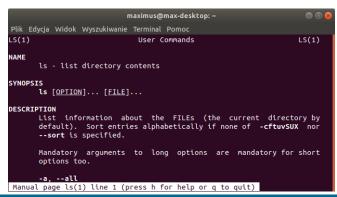


Precise description of any command

Command:

```
$ man <any_command>
```

Precise description of command ls (or any other command) can be found utilising *man* command. Example:



Precise description of any command

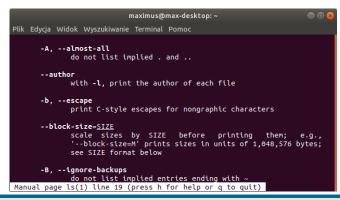
Command:

LINUX

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```
1 $ man <any_command>
```

Precise description of command *ls* (or any other command) can be found utilising *man* command. Example:



000 0000

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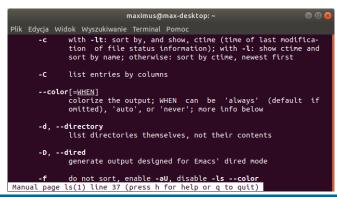
Precise description of any command

Command:

LINITX

```
$ man <any_command>
```

Precise description of command *ls* (or any other command) can be found utilising *man* command. Example:



Precise description of any command v2

Command:

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```
$ <any_command> —help
```

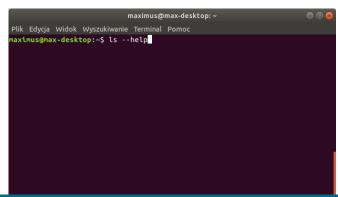
Precise description of command ls (or any other command) can be found utilising --help option. Example:

Precise description of any command v2

Command:

```
1 $ <any_command> —help
```

Precise description of command ls (or any other command) can be found utilising --help option. Example:



Precise description of any command v2

Command:

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```
$ <any_command> —help
```

Precise description of command ls (or any other command) can be found utilising --help option. Example:

```
maximus@max-desktop: ~
Plik Edycja Widok Wyszukiwanie Terminal Pomoc
maximus@max-desktop:~S ls --help
Składnia: ls [OPCJA]... [PLIK]...
Wypisanie informacji o PLIKACH (domyślnie w katalogu bieżącym). Sortowane
alfabetyczne, jeżeli nie jest podana żadna z opcji -cftuySUX ani --sort.
Argumenty obowiązkowe dla opcji długich obowiązują również dla krótkich.
  -a. --all
                             bez ukrywania plików zaczynających się od .
  -A, --almost-all
                             bez pokazywania . ani ..
      --author
                             z -l: wypisanie autora każdego pliku
  -b. --escape
                             wypisanie znaków niegraficznych ósemkowo (w s
tvlu
                               języka C, np. \012)
      --block-size=ROZMIAR
                             skala rozmiarów: np. ..--block-size=M" powoduj
                               wypisanie rozmiarów w jednostkach po 104857
                               bajtów:
                               zobacz infomacje o formacie ROZMIARÓW poniż
```

PRESENTATION

NAVIGATION THROUGH COMMANDS USING ARROWS

By pressing UP arrow and DOWNWARDS arrow we can navigate through commands that we have already executed. Example:

Navigation through commands using arrows

By pressing UP arrow and DOWNWARDS arrow we can navigate through commands that we have already executed. Example:



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LIMITX

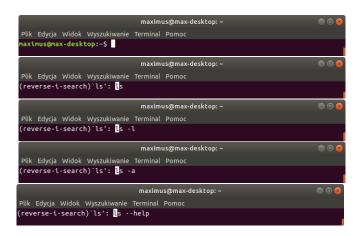
Navigation through commands v2

By pressing Ctrl + R we can search for commands that we have already executed. Example:

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NAVIGATION THROUGH COMMANDS V2

By pressing Ctrl + R we can search for commands that we have already executed. Example:



OUR TEAM

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Command:

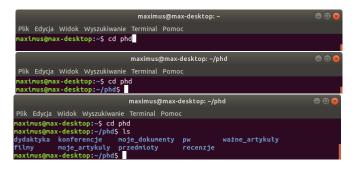
```
$ cd <folde_name>
```

Change the folder to the specified folder as a parameter. Example:

Command:

```
$ cd <folde name>
```

Change the folder to the specified folder as a parameter. Example:



Command:

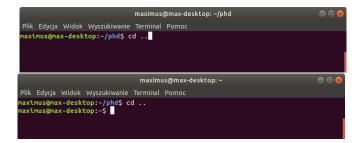
```
1 $ cd ..
```

Moves the directory back one directory (parent directory). Example:

Command:

```
$ cd ..
```

Moves the directory back one directory (parent directory). Example:



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Command:

```
1 $ cd /
```

Moves the directory back to the root directory. Example:

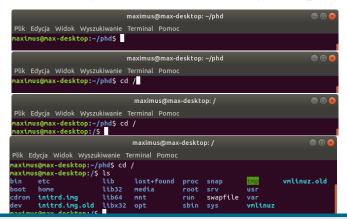
LINUX

Command:

```
1 $ cd /
```

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Moves the directory back to the root directory. Example:



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Command:

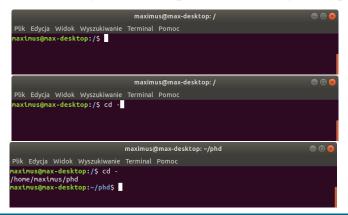
```
1 $ cd −
```

Moves the directory back to the previous directory. Example:

Command:

\$ cd -

Moves the directory back to the previous directory. Example:



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Command:

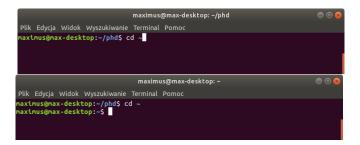
```
1  $ cd ~
```

Moves the directory to the root home directory. Example:

Command:

\$ cd \sim

Moves the directory to the root home directory. Example:



COMMAND pwd

Command:

1 \$ pwd

Prints the current directory. Example:

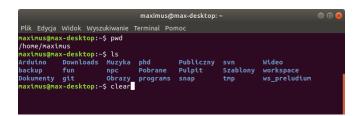


COMMAND clear

Command:

1 \$ clear

Clears the terminal screen. Example:

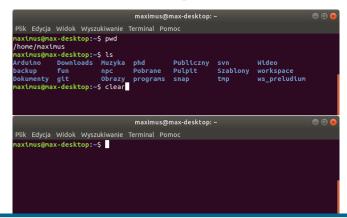


COMMAND clear

Command:

1 \$ clear

Clears the terminal screen. Example:



COMMAND mkdir

Command:

OUR TEAM

```
1 $ mkdir <folder_name>
```

Creates new folder. Example:

```
maximus@max-desktop:-/git/phd/prezentacje/introduction_to_linux/test

Plik Edycja Widok Wyszukiwanie Terminal Pomoc
maxtmus@max-desktop:-/git/phd/prezentacje/introduction_to_linux/test$ Is
maxtmus@max-desktop:-/git/phd/prezentacje/introduction_to_linux/test$

maximus@max-desktop:-/git/phd/prezentacje/introduction_to_linux/test

Plik Edycja Widok Wyszukiwanie Terminal Pomoc
maximus@max-desktop:-/git/phd/prezentacje/introduction_to_linux/test$ Is
maximus@max-desktop:-/git/phd/prezentacje/introduction_to_linux/test$ nkdir folder
```

COMMAND mkdir

Command:

| \$ mkdir <folder_name>

Creates new folder. Example:

```
maximus@max-desktop:-/git/phd/prezentacje/introduction_to_linux/test

Plik Edycja Widok Wyszukiwanie Terminal Pomoc
maxinus@max-desktop:-/git/phd/prezentacje/introduction_to_linux/test$ ls
maxinus@max-desktop:-/git/phd/prezentacje/introduction_to_linux/test$ mkdir folder
maxinus@max-desktop:-/git/phd/prezentacje/introduction_to_linux/test$ ls
folder
maxinus@max-desktop:-/git/phd/prezentacje/introduction_to_linux/test$ l
```

COMMAND mkdir v2

Command:

OUR TEAM

\$ mkdir -p <folder_name>

Creates parent folders if needed. Example:

```
maximus@max-desktop:-/git/phd/prezentacje/test © © ©

Plik Edycja Widok Wyszukiwanie Terminal Pomoc

maximus@max-desktop:-/git/phd/prezentacje/test$ ls

maximus@max-desktop:-/git/phd/prezentacje/test$ mkdir -p create/new/folder
```

COMMAND mkdir V2

Command:

OUR TEAM

```
1 $ mkdir -p <folder_name>
```

Creates parent folders if needed. Example:

```
maximus@max-desktop:-/glt/phd/prezentacje/test/create/new

Plik Edycja Widok Wyszukiwanie Terminal Pomoc
naxinus@nax-desktop:-/glt/phd/prezentacje/test$ ls
naxinus@nax-desktop:-/glt/phd/prezentacje/test$ nkdir -p create/new/folder
naxinus@nax-desktop:-/glt/phd/prezentacje/test$ cd create/
naxinus@nax-desktop:-/glt/phd/prezentacje/test$ cd create/
naxinus@nax-desktop:-/glt/phd/prezentacje/test$/create$ ls
new
naxinus@nax-desktop:-/glt/phd/prezentacje/test/create$ cd new/
naxinus@nax-desktop:-/glt/phd/prezentacje/test/create$ cd new/
naxinus@nax-desktop:-/glt/phd/prezentacje/test/create$ ls
folder
naxinus@nax-desktop:-/glt/phd/prezentacje/test/create$ cd new/
naxinus@nax-desktop:-/glt/phd/prezentacje/test/create/new$ ls
folder
naxinus@nax-desktop:-/glt/phd/prezentacje/test/create/new$ ls
```

COMMAND touch

Command:

OUR TEAM

```
$ touch <file_name>
```

Creates new file. Example:

```
maximus@max-desktop:-/glt/phd/prezentacje/test © © ②
Plik Edycja Widok Wyszukiwanie Terminal Pomoc
naxtnus@nax-desktop:-/glt/phd/prezentacje/test$ ls
create
naxtnus@nax-desktop:-/glt/phd/prezentacje/test$ touch new_file.txt
```

COMMAND touch

Command:

```
$ touch <file_name>
```

Creates new file. Example:

```
maximus@max-desktop:-/git/phd/prezentacje/test 

@ @ 
Plik Edycja Widok Wyszukiwanie Terminal Pomoc
naxinus@nax-desktop:-/git/phd/prezentacje/test$ ls
create
naxinus@nax-desktop:-/git/phd/prezentacje/test$ touch new_file.txt
naxinus@nax-desktop:-/git/phd/prezentacje/test$ ls
create new_file.txt
naxinus@nax-desktop:-/git/phd/prezentacje/test$ [
```

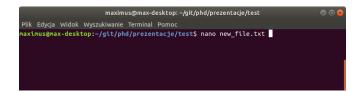
COMMAND nano

Command:

OUR TEAM

```
nano <file_name>
```

Edits the specified file in a terminal window. Example:

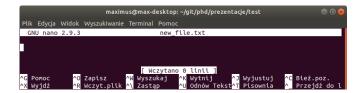


COMMAND nano

Command:

\$ nano <file_name>

Edits the specified file in a terminal window. Example:



COMMAND nano

LIMITX

Command:

OUR TEAM

| \$ nano <file_name>

Edits the specified file in a terminal window. Example:



Close the file: $Ctrl + X \rightarrow if Yes confirm with Enter$

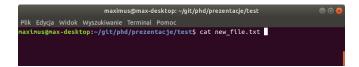
Save the file: Ctrl + O -> if Yes press Enter

COMMAND cat

Command:

\$ cat <file_name>

Concatenate files and print on the standard output. Example:



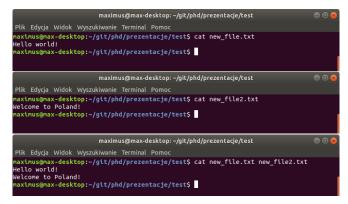
COMMAND cat

OUR TEAM

Command:

```
1 $ cat <file_name>
```

Concatenate files and print on the standard output. Example:

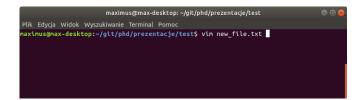


COMMAND vim

Command:

1 \$ vim <file_name>

Edits the specified file in a terminal window. Example:



COMMAND vim

LIMITX

Command:

OUR TEAM

```
1 | $ vim <file_name>
```

Edits the specified file in a terminal window. Example:

Edit the file: Esc -> i -> edit file

Close the file: Esc -> :q! -> confirm with Enter Save the file: Esc -> :w -> confirm with Enter

COMMAND gedit

Command:

```
$ gedit <file_name>
```

Text editor for the GNOME Desktop. Example:

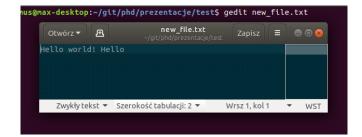
```
maximus@max-desktop:-/git/phd/prezentacje/test 🛑 🗓 🧿
```

COMMAND gedit

Command:

```
1 $ gedit <file_name>
```

Text editor for the GNOME Desktop. Example:



OUR TEAM

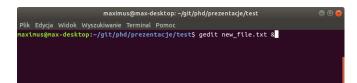


EXECUTING COMMANDS IN BACKGROUND

Command:

\$ <any_command> &

Command gedit runs the text editor for the GNOME Desktop in background. Example:



EXECUTING COMMANDS IN BACKGROUND

Command:

LIMITX

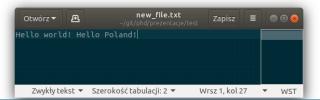
OUR TEAM

```
1 $ <any_command> &
```

Command gedit runs the text editor for the GNOME Desktop in background. Example:

```
maximus@max-desktop:-/git/phd/prezentacje/test 

Plik Edycja Widok Wyszukiwanie Terminal Pomoc
naxtnus@nax-desktop:-/git/phd/prezentacje/test$ gedit new_file.txt &
[1] 1182;
naxinus@nax-desktop:-/git/phd/prezentacje/test$
```



EXECUTING COMMANDS IN BACKGROUND

Command:

LIMITX

OUR TEAM

```
1 $ <any_command> &
```

Command gedit runs the text editor for the GNOME Desktop in background. Example:

```
maximus@max-desktop:-/git/phd/prezentacje/test 

□ □ ○

Plik Edycja Widok Wyszukiwanie Terminal Pomoc

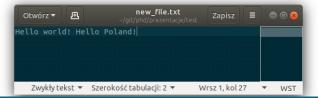
naxtnus@nax-desktop:-/git/phd/prezentacje/test$ gedit new_file.txt &

[1] 11882

naxtnus@nax-desktop:-/git/phd/prezentacje/test$ ls

create new file2.txt new file.txt

maxtnus@nax-desktop:-/git/phd/prezentacje/test$
```



COMMAND rm

Command:

```
$ rm <file_or_directory>
```

Removes specified file or directory. Example:

```
maximus@max-desktop:-/git/phd/prezentacje/test 

@ @ 
Plik Edycja Widok Wyszukiwanie Terminal Pomoc
maximus@max-desktop:-/git/phd/prezentacje/test$ ls
create new_file2.txt new_file.txt
maximus@max-desktop:-/git/phd/prezentacje/test$ rm new_file2.txt 

### Review of the content of the conten
```

COMMAND rm

Command:

```
| $ rm <file_or_directory>
```

Removes specified file or directory. Example:

```
maximus@max-desktop:-/git/phd/prezentacje/test 

@ @ 
Plik Edycja Widok Wyszukiwanie Terminal Pomoc
maximus@max-desktop:-/git/phd/prezentacje/test$ ls
create new.file2.txt new.file.txt
maximus@max-desktop:-/git/phd/prezentacje/test$ rn new_file2.txt
maximus@max-desktop:-/git/phd/prezentacje/test$ ls
create new.file2.txt
maximus@max-desktop:-/git/phd/prezentacje/test$ ls
create new.file.txt
maximus@max-desktop:-/git/phd/prezentacje/test$
```

COMMAND rm CONT

Command:

OUR TEAM

```
|  rm -r <  folder>
```

Removes directories and their contents recursively. Example:

```
maximus@max-desktop:-/git/phd/prezentacje/test

@ @ @
Plik Edycja Widok Wyszukiwanie Terminal Pomoc
naximus@max-desktop:-/git/phd/prezentacje/test$ ls
create new file.txt
naximus@max-desktop:-/git/phd/prezentacje/test$ cd create/
maximus@max-desktop:-/git/phd/prezentacje/test/create$ ls
new
naximus@max-desktop:-/git/phd/prezentacje/test/create$ cd ...
naximus@max-desktop:-/git/phd/prezentacje/test/create$ cd ...
naximus@max-desktop:-/git/phd/prezentacje/test$
```

COMMAND rm CONT

Command:

```
1 $ rm -r < folder>
```

Removes directories and their contents recursively. Example:

```
maximus@max-desktop:-/glt/phd/prezentacje/test

Plik Edycja Widok Wyszukiwanie Terminal Pomoc
naximus@max-desktop:-/glt/phd/prezentacje/test$ ls
create new_file.txt
maximus@max-desktop:-/glt/phd/prezentacje/test$ cd create/
maximus@max-desktop:-/glt/phd/prezentacje/test/create$ ls
new
maximus@max-desktop:-/glt/phd/prezentacje/test/create$ cd .
maximus@max-desktop:-/glt/phd/prezentacje/test$ r- r- create/
maximus@max-desktop:-/glt/phd/prezentacje/test$ is
new_file.txt
maximus@max-desktop:-/glt/phd/prezentacje/test$ ls
new_file.txt
maximus@max-desktop:-/glt/phd/prezentacje/test$
```

TAB COMPLETION

OUR TEAM

```
$ <part_of_command> <PRESS TAB>
```

Press 'Tab' to automatically complete the command or receive list of suggestions. Example:

```
maximus@max-desktop:-/git/phd/prezentacje/test 😑 🗈 🙃
```

TAB COMPLETION

OUR TEAM

```
$ <part_of_command> <PRESS TAB>
```

Press 'Tab' to automatically complete the command or receive list of suggestions. Example:

```
maximus@max-desktop:-/git/phd/prezentacje/test 🖨 🗈 🙃 🕞
Plik Edycja Widok Wyszukiwanie Terminal Pomoc
maximus@max-desktop:-/git/phd/prezentacje/test$ mkd
mkdir mkdosfs
maximus@max-desktop:-/git/phd/prezentacje/test$ mkd
```

ENVIRONMENT VARIABLES

Linux environment variables act as placeholders for information stored within the system that passes data to programs launched in shells or subshells.

Commands for Environment Variable:

- env The command lists all of the environment variables in the shell.
- set The command assigns or defines an environment variable.
- unset The command deletes the environment variable.
- export The command exports the value of the newly assigned environment variable.

COMMAND env

```
1 $ env
```

The command lists all of the environment variables in the shell. Example:



COMMAND env

LIMITX

\$ env

OUR TEAM

The command lists all of the environment variables in the shell. Example:

```
maximus@max-desktop: ~/git/phd/prezentacje/introduction to linux
Plik Edvcia Widok Wyszukiwanie Terminal Pomoc
maximus@max-desktop:~/qit/phd/prezentacje/introduction to linux$ env
CLUTTER_IM_MODULE=xim
LD LIBRARY PATH=/opt/ros/melodic/lib
LS COLORS=rs=0:di=01:34:ln=01:36:mh=00:pi=40:33:so=01:35:do=01:35:bd=40:33:01:cd
=40:33:01:or=40:31:01:mi=00:su=37:41:sq=30:43:ca=30:41:tw=30:42:ow=34:42:st=37:4
4:ex=01:32:*.tar=01:31:*.tgz=01:31:*.arc=01:31:*.arj=01:31:*.taz=01:31:*.lha=01:
31:*.lz4=01:31:*.lzh=01:31:*.lzma=01:31:*.tlz=01:31:*.txz=01:31:*.tzo=01:31:*.t7
z=01:31:*.zip=01:31:*.z=01:31:*.Z=01:31:*.dz=01:31:*.gz=01:31:*.lrz=01:31:*.lz=0
1:31:*.lzo=01:31:*.xz=01:31:*.zst=01:31:*.tzst=01:31:*.bz2=01:31:*.bz=01:31:*.tb
z=01:31:*.tbz2=01:31:*.tz=01:31:*.deb=01:31:*.rpm=01:31:*.jar=01:31:*.war=01:31:
*.ear=01:31:*.sar=01:31:*.rar=01:31:*.alz=01:31:*.ace=01:31:*.zoo=01:31:*.cpio=0
1:31:*.7z=01:31:*.rz=01:31:*.cab=01:31:*.wim=01:31:*.swm=01:31:*.dwm=01:31:*.esd
=01:31:*.ipg=01:35:*.ipeg=01:35:*.mipg=01:35:*.mipeg=01:35:*.gif=01:35:*.bmp=01:
35:*.pbm=01:35:*.pgm=01:35:*.ppm=01:35:*.tga=01:35:*.xbm=01:35:*.xpm=01:35:*.tif
=01:35:*.tiff=01:35:*.png=01:35:*.svg=01:35:*.svgz=01:35:*.mng=01:35:*.pcx=01:35
:*.mov=01:35:*.mpa=01:35:*.mpea=01:35:*.m2v=01:35:*.mkv=01:35:*.webm=01:35:*.oam
=01:35:*.mp4=01:35:*.m4v=01:35:*.mp4v=01:35:*.vob=01:35:*.at=01:35:*.nuv=01:35:*
.wmv=01:35:*.asf=01:35:*.rm=01:35:*.rmvb=01:35:*.flc=01:35:*.avi=01:35:*.fli=01:
35:*.flv=01:35:*.al=01:35:*.dl=01:35:*.xcf=01:35:*.xwd=01:35:*.vuv=01:35:*.cam=0
1;35:*.emf=01;35:<sup>*</sup>.ogv=01;35:*.ogx=01;35:*.aac=00;36:*.au=00;36:*.flac=00;36:*.m
4a=00;36:*.mid=00;36:*.midi=00;36:*.mka=00;36:*.mp3=00;36:*.mpc=00;36:*.ogg=00;3
6:*.ra=00:36:*.way=00:36:*.oga=00:36:*.opus=00:36:*.spx=00:36:*.xspf=00:36:
```

COMMAND env

\$ env

OUR TEAM

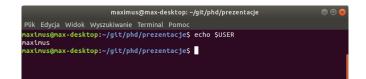
The command lists all of the environment variables in the shell. Example:

```
maximus@max-desktop: ~/git/phd/prezentacje/introduction to linux
Plik Edvcia Widok Wyszukiwanie Terminal Pomoc
LANG=pl_PL.UTF-8
DISPLAY=:0
GNOME SHELL SESSION MODE=ubuntu
FDTTOR=nano -w
ROS_ETC_DIR=/opt/ros/melodic/etc/ros
COLORTERM=truecolor
USERNAME=maximus
JAVA HOME=/usr/lib/ivm/iava-8-oracle
J2SDKDIR=/usr/lib/ivm/iava-8-oracle
XDG VTNR=2
SSH_AUTH_SOCK=/run/user/1001/kevring/ssh
MANDATORY_PATH=/usr/share/gconf/ubuntu.mandatory.path
LC NAME=pl PL.UTF-8
XDG SESSION ID=2
DERBY HOME=/usr/lib/ivm/iava-8-oracle/db
USER=maximus
DESKTOP SESSION=ubuntu
QT4_IM_MODULE=xim
TEXTDOMAINDIR=/usr/share/locale/
GNOME TERMINAL SCREEN=/org/gnome/Terminal/screen/1c6ca3d1 96e2 45af 8c70 2cf6912
f6267
DEFAULTS PATH=/usr/share/gconf/ubuntu.default.path
```

COMMAND echo

\$ echo \$<SYSTEM_ENVIRONMENT>

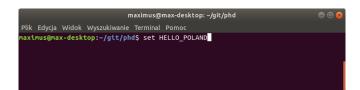
Displays the line of text. If you use \$ you can print the content of the SYSTEM ENVIRONMENT. Example:



COMMAND set

OUR TEAM

\$ set HELLO_POLAND



OUR TEAM

```
$ export HELLO_POLAND="SUMMER_SCHOOL"
```

```
maximus@max-desktop:~/git/phd @ @ @
Plik Edycja Widok Wyszukiwanie Terminal Pomoc
maximus@max-desktop:~/git/phd$ export HELLO_POLAND="SUMMER_SCHOOL"
```

OUR TEAM

```
1 | $ export HELLO_POLAND="SUMMER_SCHOOL"
```

```
maximus@max-desktop: -/git/phd

Plik Edycja Widok Wyszukiwanie Terminal Pomoc

XDG_SESSION_ID=2

DERBY_HOME=/usr/llb/jvm/java-8-oracle/db

USER=maxlmus
DESKTOP_SESSION=bubuntu

HELLO POLAMD=SUMMER_SCHOOL

QT4_IM_MODULE=x-tn

TEXTDOMAINDIR=/usr/share/locale/
GNOME_TERMINAL_SCREEN=/org/gnome/Terminal/screen/1c6ca3d1_96e2_45af_8c78_2cf6912
f6267

DEFAULTS_PATH=/usr/share/gconf/ubuntu.default.path
```

OUR TEAM

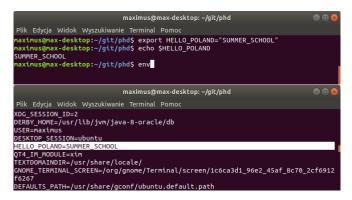
```
$ export HELLO_POLAND="SUMMER_SCHOOL"
```

```
maximus@max-desktop: -/git/phd @ @ @ Plik Edycja Widok Wyszukiwanie Terminal Pomoc
maxtnus@max-desktop:-/gtt/phd$ export HELLO_POLAND="SUMMER_SCHOOL"
```

LINUX

OUR TEAM

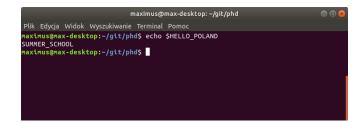
| \$ export HELLO_POLAND="SUMMER_SCHOOL"



COMMAND unset

1 \$ unset HELLO_POLAND

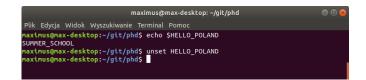
The command deletes the environment variable. Example:



COMMAND unset

\$ unset HELLO_POLAND

The command deletes the environment variable. Example:



COMMAND unset

\$ unset HELLO_POLAND

The command deletes the environment variable. Example:

```
maximus@max-desktop: -/git/phd

Plik Edycja Widok Wyszukiwanie Terminal Pomoc
maximus@max-desktop:-/git/phd$ echo $HELLO_POLAND
SUMMER_SCHOOL
maximus@max-desktop:-/git/phd$ unset HELLO_POLAND
maximus@max-desktop:-/git/phd$ echo $HELLO_POLAND
maximus@max-desktop:-/git/phd$
```

FILES .BASHRC AND /.BASH_PROFILE

In order to create persistent environment variables use configuration files: .bashrc and /.bash_profile. Example:

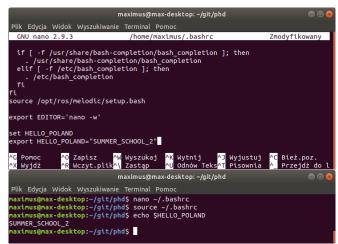


OUR TEAM

LABS.

FILES .BASHRC AND /.BASH_PROFILE

In order to create persistent environment variables use configuration files: .bashrc and /.bash_profile. Example:



COMMAND source

LINUX

OUR TEAM

```
$ source <file_name>
```

Executes the content of the script passed as an argument, in the current shell. Example:

```
maximus@max-desktop:-/git/phd 
@ @ @
Plik Edycja Widok Wyszukiwanie Terminal Pomoc
maxlnus@max-desktop:-/git/phd$ nano -/.bashrc
maxlnus@max-desktop:-/git/phd$ source -/.bashrc
maxlnus@max-desktop:-/git/phd$ echo $HELLO_POLAND
SUMMER_SCHOOL_2
maxlnus@max-desktop:-/git/phd$ 

### Total Poland
##
```

Stops the running program. Example:

```
maximus@max-desktop:-/git/phd

@ @ @
Plik Edycja Widok Wyszukiwanie Terminal Pomoc

maxtmus@max-desktop:-/git/phd$ ping www.robotyka.ia.pw.edu.pl
PINo robotyka.ia.pw.edu.pl (194.29.160.136) 56(84) bytes of data.

64 bytes from segomo.elka.pw.edu.pl (194.29.160.136): tcmp_seq=1 ttl=55 time=7.97 ms

64 bytes from segomo.elka.pw.edu.pl (194.29.160.136): tcmp_seq=2 ttl=55 time=6.92 ms
```

Stops the running program. Example:

```
maximus@max-desktop:-/git/phd

Plik Edycja Widok Wyszukiwanie Terminal Pomoc
maximus@max-desktop:-/git/phd$ ping www.robotyka.ia.pw.edu.pl
PliNG robotyka.ia.pw.edu.pl (194.29.160.136) 56(84) bytes of data.
64 bytes from segomo.elka.pw.edu.pl (194.29.160.136): icmp_seq=1 ttl=55 time=7.97 ms
64 bytes from segomo.elka.pw.edu.pl (194.29.160.136): icmp_seq=2 ttl=55 time=6.92 ms
64 bytes from segomo.elka.pw.edu.pl (194.29.160.136): icmp_seq=3 ttl=55 time=8.13 ms
64 bytes from segomo.elka.pw.edu.pl (194.29.160.136): icmp_seq=4 ttl=55 time=9.77 ms
^C
--- robotyka.la.pw.edu.pl ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3005ms
rtt min/avg/max/mdev = 6.920/8.199/9.772/1.026 ms
maximus@max-desktop:-/git/phd$
```

QUESTION?

LINUX

OUR TEAM

Question: What should we do if we have a huge project, i.e. > 1000 lines of code?

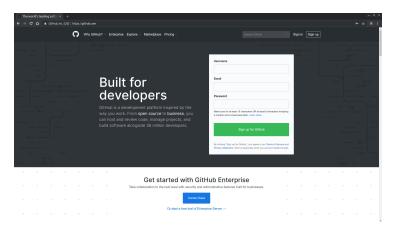
QUESTION?

Question: What should we do if we have a huge project, i.e. > 1000 lines of code? We should use tools facilitating version control (e.g. Git):

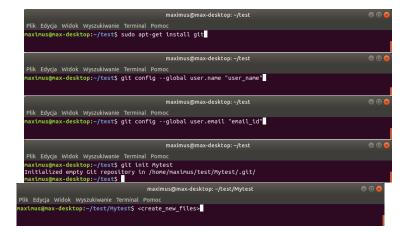
Version control is a system that records changes to a file or set of files over time so that you can recall specific versions later.

QUESTION?

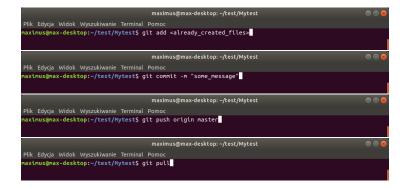
Question: What should we do if we have a huge project, i.e. > 1000 lines of code?



GIT COMMANDS



GIT COMMANDS

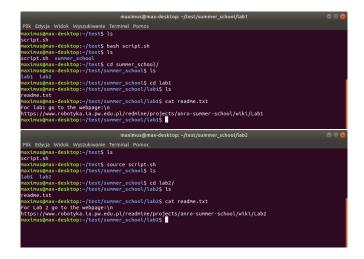


How to execute subsequent commands?

We can use scripts:

```
maximus@max-desktop: ~/test
Plik Edycja Widok Wyszukiwanie Terminal Pomoc
 GNU nano 2,9,3
                                                 script.sh
                                                                                            Zmodvfikowany
kdir summer school
d summer school
nkdir labī : mkdir lab2
touch lab1/readme.txt ; touch lab2/readme.txt
echo "For lab1 go to the webpage:\n">>>lab1/readme.txt
echo "https://www.robotyka.ia.pw.edu.pl/redmine/projects/anro-summer-school/wiki/Lab1" | lab1/readme.txt
echo "For Lab 2 go to the webpage:\n">> lab2/readme.txt
echo "https://www.robotyka.ia.pw.edu.pl/readmine/projects/anro-summer-school/wiki/Lab2">>>lab2/readme.txt
^G Pomoc
                              AW Wyszuka1
                                              ^K Wytnii
                                                             ^J Wviustui
                                                                             ^C Bież.poz.
```

HOW TO EXECUTE SUBSEQUENT COMMANDS?



SUMMER SCHOOL - LABORATORIES

Web page:

https://www.robotyka.ia.pw.edu.pl/redmine/projects/anrosummer-school/wiki

The plan of laboratories:

- Preparation
- Lab 1: Introduction to ROS
- · Lab 2: Modelling and visualization of manipulator
- Lab 3: Forward kinematics
- Lab 4: Interpolation of motion
- · Lab 5: Inverse kinematics

ROS TUTORIALS

Web page: http://wiki.ros.org/ROS/Tutorials

SIMPLE SIMULATION

Video

Thank you for your attention!